San Francisco, Calif.,
November 6, 1922.

MEMORANDUM FOR MR. COFFMAN

FOREST INSECT CONDITIONS ON THE CALIFORNIA NATIONAL FOREST

The following summary is based upon the data secured during our recent trip together on the California.

Period covered by field work, October 17-31, 1922.

AREA COVERED AND METHODS

The trip was made by auto from Willows to Log Springs Ranger Station, Black Butte, Alder Springs, Pinnacle Rock Lookout, Upper Lake, Elk Mountain Ranger Station, Hullville and Blabon Ranger Station. Wherever possible counts were made of recently-killed trees which could be seen from the roads traveled and from good lookout points near the route. A trip was made on foot to Boardman Ridge. In addition a check area of 768 acres was selected on the north slope of Elk Mountain and all recently-killed trees marked and numbered.

CONDITIONS INDICATED BY EXTENSIVE SPOTTING

A summary of the results secured from extensive spotting is attached to this report. The fading and red trees were counted on a total of 113 sections, approximating 75,000 acres, and a total of 2013 yellow pine and 398 sugar pine were counted. Applying the factors determined to allow for trees which could not be seen in extensive viewing, and using the average volumes determined by former control work on the Goodyear Project and marking the Elk Mountain Check Area, this indicates a total killing for the area covered of 8241 trees with a total volume of 15,561,065 board feet. This loss is composed of the overwintering brood trees attacked in the fall of 1921, the summer brood trees of 1922 and the winter brood trees attacked in the fall of 1922 which had faded up to the last of October. About 80% of this killing occurred during the summer of 1922. It is nonsidered that not more than 35% of the fall attack had faded at the time of this examination. On this basis the killing for the season of 1922 will equal or exceed the total loss figures given in the above estimates.

STATUS OF THE INFESTATION

The primary infestation found in practically all mature trees examined consisted of western pine beetle in yellow pine and the mountain pine beetle in sugar pine. Reproduction and pole stands of yellow pine are being killed in large groups, and in these cases the western pine beetle is also the cause. No attacks by Ips beetles were noted during the examination.

The most striking feature of the entire situation is the sudden epidemic development during the season of 1922. None of the areas examined was badly infested during the season of 1921. On the Elk Mountain Check Area the 1921 overwintering infestation of 25 trees with 54,190 board feet suddenly increased during the summer attack to 171 trees with 323,490 board feet--an increase of 597%.

This increase was much heavier on the west side than on the east side of the forest. On the 56 sections spotted on the east side or Sacramento drainage, the loss amounted to 3,286,940 board feet or 58,695 feet per section. On 47 sections spotted on the Eel River drainage on the west side the loss amounted to 11,627,125 board feet, or an average of 247,428 board feet per section.

The actual extent of the epidemic condition, aside from the areas which were spotted, was not determined. From what could be seen of the Eel River drainage, conditions outside of the areas covered by this survey corresponded very closely to those which were estimated. This assumption is borne out by the occasional verbal reports of forest officers and others who have been over the forest this season.

CAUSES OF THE EPIDEMIC

No satisfactory explanation of the sudden increase can be made from the data secured during this survey. It seems reasonable to assume that the heavy windfalls that occurred in January, 1921, when 25 million feet of timber was blown down on the Eel River drainage, had much to do with the building up of the epidemic.

It is to be expected that the Ips and Dendroctonus beetles would find a very favorable breeding ground in the slash created by the windfall, and that there would be an increase during the season of 1921 which would become apparent in the fall attacks upon standing trees. It would also be expected that the summer attacks of 1922 in standing trees would be correspondingly heavy.

To a certain extent this seems to have happened. The infestation was found to be somewhat heavier around or near the worst windfall areas on Erickson Ridge and Boardman Ridge than on any other part of the area covered by the survey.

The points which seem to discredit the windfall as a complete or satisfactory explanation for the present epidemic are the following:

1. Failure of barkbeetles to breed to any great extent in the windfalls. Only occasionally can a log be found from which anything like a normal emergence had occurred. Most of the down logs show only the work of flatheads and secondary borers.

As a rule, the barkbeetles that breed most successfully in slash are several species of Ips which may, upon leaving the down logs and tops, attack heavily in tops of large standing trees and in groups of small pole stands. Evidence of Ips infestation is strikingly absent in the 1922 attacks. Even the killing of pole stands down to the smallest diameters seems to be due entirely to Dendroctonus brevicomis. This statement, however, is based upon the examination of a very limited number of trees.

2. The epidemic is not limited to the region where the heavy windfalls occurred, but is widespread throughout the entire forest. Probably more than the usual number of windfalls occurred everywhere in the spring of 1921, but the infestation is very bad everywhere, regardless of the degree of windfall damage.

Some of the largest groups killed in 1922 were found at considerable distances from any of the known windfall areas. On the Elk Mountain Check Area , located several miles distant from any known large windfall areas, the infestation was found to be very heavy, including two large groups of more than fifty mature trees. A few windthrown trees were found on the check area which were near its eastern boundary. The infestation in the vicinity of these windfalls, however, was comparatively light, the heavy groups of the check area occurring more than a mile distant, with no windfalls in their vicinity.

The only general conclusion that can be drawn is that while windfalls may have influenced the increase of the infestation, other causes as well have contributed to the genefal epidemic condition now prevalent.

POSSIBLE COURSE OF THE EPIDEMIC

It would be useless to attempt a forecast of the development of the infestation for the season of 1923. In other situations similar to this one that have been studied, the peak of the epidemic loss is usually reached when the infestation has developed to a point where large groups of 25 or more trees become prevalent. From the large centers of infestation developed in these groups, the beetles usually disperse to attack single trees or small scattered groups elsewhere in the stand. This is usually accompanied by a decline in the volume of annual loss. While it seems probable that there may be a decline in 1923, a fairly heavy loss for that season is to be expected.

TOTAL LOSS FOR THE CALIFORNIA FOREST DURING 1922

That the area covered by the survey is but a small part of the general region affected by the epidemic is quite evident. From reports it would seem that the conditions found in the survey apply generally to California. The total loss can be approximated only by assuming that the two types of conditions found on the east and west sides of the Forest apply to the general timbered acreage so distributed. Such an estimate, assuming that the 1922 loss will just about equal the total spotting, would give us the following:

Total timbered acreage of Forest, government and private	450,000 A.	
Eastern part of forest where loss averages 58,695 b.f. per section or about 90 b.f. per acre	200,000 "	
Total loss at 90 b.f. per acre		18,000 MBM
Western part of forest where loss averages 247,428 b.f. per section or about 380 b.f. per acre	250,000 "	
Total loss at 380 b.f. per acre		95,000 MBM
Total		113,000 MBM

No attempt has been made to differentiate between the losses on the National Forest and private holdings, as this would require a much more detailed survey than time was available for this season.

POSSIBILITIES OF CONTROL

The distribution of the epidemic conditions is so widespread that control cannot be considered except on a very broad scale. The working next season of a few local areas or units of infestation, such as have been considered for control projects in District 5, would hardly constitute even a start upon the control of the general epidemic.

ESTIMATED COST OF SURVEY

Before a control plan can be outlined or definite estimates made, a control survey similar to that made on the Northern California-Southern Oregon project would have to be carried out during June of next season. Applying this factor to the total estimate of 113 million board feet, an overwintering infestation of 50,580,000 board feet can be expected on the Forest in the spring of 1923. If this can be treated at a cost of $3.50 per M the project would require an expenditure of $175.000. Even if the amount of infested timber to be treated is cut down 50%, the cost would still amount to $87,500.

Control plans can best await developments of the 1923 season. A survey in the late summer or early fall will determine whether or not the present epidemic will continue, or subside because the unusual conditions under which it developed no longer exist.

TIMBER KILLED BY INSECTS - CALIFORNIA NATIONAL FOREST

SUMMARY OF TREES COUNTED BY EXTENSIVE VIEWING AND ESTIMATES OF LOSS, SEASON 1922

Field Work: October 18 - 25, 1922.
J. D. Coffman
J. M. Miller.

AREA COVERED	NUMBER SECTIONS	NUMBER TREES COUNTED YELLOW PINE	SUGAR PINE	TOTAL BOTH SPECIES NO. TREES	VOLUME
1. Counted from road Log Springs R. S. to Black Butte,	19	160	20		
2. Counted from Black Butte Lookout,	19	115	32		
3. Counted from Black Butte to Summit Spring's Hill	12	146	24		
4. Counted from Alder Springs	6	44	26		
TOTAL	56	465	102		
Factor used for estimate, 3.5					
Total trees estimated,		1,628	357	1,985	
Average volume,		1,480	2,500		
Total volumes,		2,409,440	877,500		3,286,940
5. Counted from Pinnacle Rock Lookout,	10	158	40		
Factor used for estimate 2.5					
Total trees estimated		395	100	495	
Average volume,		1,000	2,500		
Total volumes,		395,000	250,000		645,000
6. Counted from Elk Mt. Ranger Station to Hullville	25	462	109		
7. Counted from Gravelley Valley on Erickson Ridge San Bedria Mt. and Tule Ridge	15	464	117		
8. Counted from south slope Hull Mt. and Boardman Ridge	7	464	30		
TOTAL	47	1,390	256		
Factor used 3.5					
Total trees estimated		4,865	896	5,761	
Average volume		1,695	3,946		
Total volume		8,093,525	3,535,600		11,629,125
GRAND TOTAL	113			8,241	15,561,065

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Insect Control-California

ELK MOUNTAIN CHECK AREA

CALIFORNIA NATIONAL FOREST

LOCATION:

The North slope of Elk Mountain on road from Elk Mountain Ranger Station to Hullville, center of area marked by large group of dead trees approximately 4.4 miles from Elk Mountain Ranger Station. Area consists of strip 48 chains wide by two miles long and includes 768 acres. A map will be prepared showing topography and location.

DATE OF FIELD WORK:

October 26, 27, 28, 29 and 30, 1922 J. D. Coffman and J. M. Miller.

TYPE AND STAND:

Timber is of the best quality to be found in the region. The stand is estimated at 25,000 B. F. per acre, 50% being Douglas fir which is in no way affected by the present epidemic condition of the infestation.

The stand of yellow pine and sugar pine is estimated to be approximately 10,000,000 B. F.

METHODS OF CRUISING:

The area was cruised by compass strips 8 chains in width. A 100% marking was made of insect killed pine as far back as 1919. Diameters and log lengths were taken by Biltmore scale. It is not considered that all of the 1919 and 1920 trees were marked, due to difficulty of distinguishing black topped trees, but the 1921 and 1922 trees are fairly complete.

SUMMARY OF MARKING:

YELLOW PINE

YEAR OF LOSS	NO. TREES	TOTAL D.B.H.	VOLUME BY GENERATION	TOTAL AN.LOSS
C-1919	8	238	12,500*	12,500
D-1920	6	194	13,390*	13,390
E-1921				
Summer Brood	3	138	13,400	
Winter Brood	23	736	49,550	62,950
F-1922				
Summer Brood	152	4,300	242,270	
" Winter Brood	26**	780	41,950	284,220
TOTAL	220	6,386	373,060	373,060

AVERAGE D. B. H. 29"
AVERAGE VOLUME 1695.727

SUGAR PINE

YEAR OF LOSS	NO. TREES	TOTAL D.B.H.	VOLUME BY GENERATION	TOTAL AN.LOSS
C-1919	2	86	8,550	8,550
D-1920	2	112	14,830	14,830
E-1921				
Summer Brood				
Winter Brood	2	74	4,690	4,690
F-1922				
Summer Brood	19	804	81,220	
Winter Brood	7	244	16,990	98,210
TOTAL	32	1,320	126,280	126,280

AVERAGE D. B. H. 41.25
AVERAGE VOLUME 3946.25

*Trees could not be separated by generations due to deterioration.
**Due to green foliage only a part of the overwintering trees could be found at time of marking. The remainder will be located at a subsequent examination in the spring of 1923.

ESTIMATE OF 1922 LOSS:

Estimate of Loss for 1922

TREES MARKED AND UNMARKED

	YELLOW PINE NO. TREES	YELLOW PINE VOLUME	SUGAR PINE NO. TREES	SUGAR PINE VOLUME
Summer Brood	152	242,270	19	81,220
Winter Brood	28	41,950	7	16,990
Usually not more than 25% of the overwintering brood trees have faded so that they can be detected by the last of October. It is considered that about one-third of the 1922 overwintering broods were found on this marking. The 1922 overwintering trees should therefore be augmented as follows:	56	82,900	14	98,210
Total annual loss for 1922	216	367,120	40	196,420

Total both species,	563,540 B.F.
Estimate volumeof pine stand,	10,000 M.B.M.
Percent killed season of 1922,	5.6%
Total number trees counted in extensive spotting of check area (these with fading, sorrel or red foliage)	71
Total trees of this class marked on check, by strip cruising (E winter broods and F. Summer and winter broods)	234
Factor to be applied to counts in extensive spotting,	3.3

WINDFALL CONDITIONS:

No large areas of windfall like those occuring near Erickson Ridge and Boardman Ridge, were noted anywhere within the general region of the check area. Occasional windfalls were found in the marking which totaled as follows:

	No. Trees	Volume.
Yellow Pine	12	23,550
Sugar Pine	6	32,150
	18	65,700

GROUPING OF TREES KILLED, SEASON OF 1922.

Main groups ranging from 4 to 60 trees each were marked. In addition there were scattered trees occuring individually or in groups of less than 5. The largest group marked contained 59 yellow pine trees, averaging 27.1 and one sugar pine of 18 inches D.B.H.

KILLING OF POLE STANDS.

Killing of pole stands ranging from 4 to 12 inches D.B.H. was also present. Three groups containing 109.20 and 24 trees respectively were counted on the area.

J. M. Miller

ELK MOUNTAIN CREEK AREA

CALIFORNIA NATIONAL FOREST

Markings October 25 - 30, 1922.

SUGAR PINE 1919 WINTER & SUMMER BROODS

TREE NUMBER	D. B. H.	NO. LOGS	VOLUME, F.B.M.
C-9	36	8	7,110
C-10	30	7	1,440
2	86		8,550

ELK MOUNTAIN CHECK AREA

CALIFORNIA NATIONAL FOREST

Marking: October 25 - 30, 1922.

SUGAR PINE 1920 WINTER BROOD

TREE NUMBER	D.B.H.	NO. LOGS	VOLUME, F.B.M.
D-6	64	9	9,900
D-7	48	8	4,930
2	112		14,830

ELK MOUNTAIN CHECK AREA

CALIFORNIA NATIONAL FOREST

Marking: October 25 - 30, 1922.

SUGAR PINE 1921 WINTER BROOD

TREE NUMBER	D.B.H.	NO. LOGS	VOLUME, F.B.M.
E-3	44	6	3,250
E-14	30	7	1,440
2	74		4,690

ELK MOUNTAIN CHECK AREA

CALIFORNIA NATIONAL FOREST

Marking: October 25 - 30, 1922.

SUGAR PINE 1922 SUMMER BROOD

TREE NUMBER	D. B. H.	NO. LOGS	VOLUME, F.B.M.
F-6	42	6	2,880
F-8	40	8	3,130
F-80	56	9	7,560
F-92	74	11	14,560
F-94	44	9	4,350
F-95	38	9	3,130
F-98	12	1	40
F-99	14	2	100
F-101	44	8	3,980
F-102	60	10	9,210
F-103	30	7	1,440
F-104	40	7	2,800
F-105	54	9	6,980
F-106	44	9	4,350
F-144	46	6	3,650
F-145	46	6	3,650
F-146	22	3	310
F-147	48	5	3,660
F-216	50	8	5,440
19	804		81,220

ELK MOUNTAIN CHECK AREA

CALIFORNIA NATIONAL FOREST

Marking: October 25 - 30, 1922.

SUGAR PINE 1922 WINTER BROOD

TREE NUMBER	D. B. H.	NO. LOGS	VOLUME, F.B.M.
F-7	48	7	4,460
F-29	18	1	70
F-69	22	1	100
F-96	30	3	1,700
F-124	38	4	1,830
F-143	32	5	1,270
F-214	56	9	7,560
7	244		16,990

BLK MOUNTAIN CHECK AREA

CALIFORNIA NATIONAL FOREST

Marking: October 25 - 30, 1922.

YELLOW PINE 1919 SUMMER & WINTER BROODS

TREE NUMBER	D. B. H.	NO. LOGS	VOLUME, F.B.M
C-1	38 "	4	2,000
C-2	26	3	550
C-3	18	1	70
C-4	38	6	2,600
C-5	20	2	180
C-6	24	3	440
C-7	28	5	1,060
C-9	46	9	5,600
8	238.		12,500

ELK MOUNTAIN CHECK AREA

CALIFORNIA NATIONAL FOREST

Marking: October 25 - 30, 1922.

YELLOW PINE 1920 SUMMER & WINTER BROODS

TREE NUMBER	D.B.H.	NO. LOGS	VOLUME, F.B.M.
D-1	32	7	2,010
D-2	40	8	3,700
D-3	24	4	570
D-4	22	3	350
D-5	32	6	1,760
D-8	44	9	5,000
6	194		13,390

ELK MOUNTAIN CHECK AREA

CALIFORNIA NATIONAL FOREST

Marking: October 25 - 30, 1922.

YELLOW PINE 1921 SUMMER BROOD

TREE NUMBER	D. B. H.	NO. LOGS	VOLUME, F.B.M.
E-2	42"	5	3,000
E-13	44	6	3,700
E-27	52	8	6,700
3	138		13,400

ELK MOUNTAIN CHECK AREA

CALIFORNIA NATIONAL FOREST

Marking: October 25 - 30, 1922.

YELLOW PINE 1921 WINTER BROOD

TREE NUMBER	D.B.H.	NO. LOGS	VOLUME B.F.B.M.
E-1	30"	4	1,050
E-4	28	4	860
E-5	56	8	7,900
E-6	46	8	5,000
E-7	24	5	710
E-8	32	6	1,760
E-9	32	6	1,760
E-10	34	7	2,300
E-11	28	6	1,260
E-12	36	7	2,600
E-15	14	2	100
E-16	18	2	140
E-17	30	7	1,720
E-18	38	7	2,900
E-19	38	7	2,900
E-20	32	6	1,760
E-21	54	9	7,900
E-22-	22	3	350
E-23	24	4	570
E-24	36	6	2,300
E-25	22	3	350
E-26	28	5	1,060
E-28	34	7	2,300
23	736		49,550

ELK MOUNTAIN CHECK AREA

CALIFORNIA NATIONAL FOREST

Marking: October 25 - 20,1922.

YELLOW PINE 1922 SUMMER BROOD

TREE NUMBER	D.B.H.	NO. LOGS	VOLUME, F.B.M.
F-1	28	3	680
F-2	42	6	3,300
F-3	46	7	4,600
F-4	40	4	2,300
F-5	28	3	680
F-9	22	5	580
F-10	38	6	2,600
F-11	40	6	2,900
F-12	38	6	2,600
F-13	32	5	1,520
F-14	24	4	570
F-15	20	2	180
F-16	22	3	350
F-17	28	4	860
F-18	20	2	180
F-19	36	6	2,300
F-20	22	3	350
F-21	32	5	1,520
F-22	22	4	460
F-23	28	5	1,060
F-24	30	5	1,280
F-25	28	4	860
F-26	12	1	40
F-27	16	1	60
F-28	18	1	70
F-30	20	2	180
F-31	30	5	1,280
F-32	24	3	440
F-33	12	1	40
F-34	22	3	350
F-35	38	6	2,600
F-36	36	6	2,300

YELLOW PINE #2

TREE NUMBER	D.B.H.	NO. LOGS	VOLUME, F. B. M.
F-37	38	8	3,300
F-38	38	4	2,000
F-39	36	6	2,300
F-40	20	1	90
F-41	30	5	1,280
F-42	30	5	1,280
F-43	22	3	350
F-44	18	2	140
F-45	26	4	700
F-46	26	4	700
F-47	26	4	700
F-48	22	3	350
F-49	32	5	1,520
F-50	26	4	700
F-51	34	6	2,000
F-52	18	2	140
F-53	34	7	2,300
F-54	28	5	1,060
F-55	24	5	710
F-56	16	2	120
F-57	14	1	50
F-58	16	1	60
F-59	42	9	4,500
F-60	18	2	140
F-61	38	4	2,000
F-62	40	7	3,300
F-63	50	8	6,100
F-64	30	5	1,280
F-65	20	3	290
F-66	32	6	1,760
F-67	38	7	2,900
F-68	26	6	1,040
F-70	46	7	4,600
F-71	44	6	3,700
F-72	36	8	2,900
F-73	56	8	7,900

YELLOW PINE #3

TREE NUMBER	D.B.H.	NO. LOGS	VOLUME, F.B.M.
F-74	54	7	6,900
F-76	32	7	2,010
F-77	34	7	2,300
F-78	30	7	1,720
F-79	32	7	2,010
F-81	50	8	6,100
F-82	34	7	2,300
F-91	38	7	2,900
F-97	36	7	2,600
F-100	30	7	1,720
F-107	34	4	1,480
F-108	28	5	1,060
F-109	20	4	380
F-111	20	3	290
F-112	24	2	300
F-113	36	5	2,000
F-115	26	4	700
F-116	24	5	710
F-117	14	3	170
F-118	18	3	230
F-119	20	4	380
F-120	28	5	1,060
F-121	26	5	870
F-122	18	4	320
F-123	16	1	60
F-125	28	5	1,060
F-126	18	3	230
F-127	14	2	100
F-128	22	3	350
F-129	14	1	50
F-130	14	2	100
F-141	16	2	120
F-142	26	4	700
F-148	14	2	100
F-149	14	3	170
F-159	18	2	140
F-160	38	7	2,900
F-93	52	10	7,800

YELLOW PINE #4

TREE NUMBER	D.B.H.	NO. LOGS	VOLUME, F.B.M.
F-161	38	7	2,900
F-162	12	1	40
F-163	16	1	60
F-164	36	6	2,300
F-165	12	1	40
F-166	34	5	1,760
F-167	34	6	2,000
F-168	50	8	6,100
F-169	24	3	440
F-170	32	5	1,520
F-171	32	5	1,520
F-172	16	1	60
F-173	26	4	700
F-174	14	1	50
F-175	16	1	60
F-176	14	1	50
F-177	18	2	140
F-178	16	1	60
F-179	26	3	550
F-180	16	1	60
F-181	24	3	440
F-182	16	2	120
F-187	24	3	440
F-188	20	3	290
F-192	24	3	440
F-193	16	2	120
F-194	50	10	7,200
F-195	46	8	5,000
F-196	26	7	1,230
F-197	50	7	5,700
F-198	52	7	6,300
F-199	56	9	8,500
F-200	20	3	290
F-201	20	3	290
F-202	18	2	140
F-203	20	3	290
F-204	16	2	120
F-205	12	2	80

YELLOW PINE #5

TREE NUMBER	D.B.H.	NO. LOGS	VOLUME, F.B.M.
F-206	12	2	80
F-207	46	7	4,600
F-208	50	8	6,100
F-209	32	5	1,520
F-210	38	8	3,300
F-211	34	7	2,300
F-212	18	3	230
F-213	48	9	6,100
F-215	36	8	2,900
152	4,300		242,270

ELK MOUNTAIN CHECK AREA

CALIFORNIA NATIONAL FOREST

Marking: October 25 - 30, 1922.

YELLOW PINE 1922 WINTER BROOD

TREE NUMBER	D.B.H.	NO. LOGS	VOLUME, F.B.M.
F-75	40	6	3,700
F-83	36	7	2,600
F-84	20	3	290
F-85	36	8	3,300
F-86	26	5	870
F-87	44	9	5,000
F-88	44	9	5,000
F-89	40	8	3,700
F-90	36	8	3,300
F-110	32	5	1,520
F-114	26	4	700
F-150	16	4	270
F-151	20	4	390
F-152	12	1	40
F-153	24	5	710
F-154	14	2	100
F-155	28	5	1,060
F-156	16	3	190
F-157	22	4	460
F-158	38	4	2,000
F-183	32	4	1,250
F-184	30	4	1,050
F-185	24	4	570
F-186	20	3	290
F-189	36	7	2,600
F-190	20	2	180
F-191	20	4	380
F-217	24	3	440
28	780		41,950

ELK MOUNTAIN CHECK AREA

CALIFORNIA NATIONAL FOREST

Cruised, October 26, 27, 28, 29 and 30, 1922. J. D. Coffman and J. M. Miller.